

# Notice of Allowability

Application No.

09/814,299

Examiner

Kandasamy Thangavelu

Applicant(s)

WESSOL ET AL.

Art Unit

2123

## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to March 21, 2005.
2. ☒ The allowed claim(s) is/are 1-4 and 6-43.
3. ☒ The drawings filed on 21 March 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All   b) ☐ Some\*   c) ☐ None   of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

### Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

KEVIN J. TESTA  
SUPERVISORY  
PATENT EXAMINER

## **DETAILED ACTION**

### ***Introduction***

1. This communication is in response to the Applicants' communication dated March 21, 2005. Claims 1, 6, 12, 17, 20-32, 38 and 43 were amended. Claim 5 was canceled. Claims 1-4 and 6-43 of the application are pending.

### ***Drawings***

2. The drawings submitted on March 21, 2001 are accepted.

### ***Examiner's Amendment***

3. Authorization for this examiner's amendment was given in a telephone conversation by Mr. Stephen Christian on May 23, 2005.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

4. In the Claims:

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In amended Claim 15, Lines 1-3, "A method according to claim 13, wherein the defining the material to be associated with each uniform volume element further comprises mapping each the material to an array"

has been changed to

-- A method according to claim 13, wherein the defining the material to be associated with each uniform volume element further comprises mapping each material to an array --.

### ***Reasons for Allowance***

5. Claims 1-4 and 6-43 of the application are allowed over prior art of record.

6. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

(1) an image processing system and a process for imaging a specimen during chemical or biological activity; a processor is used to analyze the images immediately upon acquisition and to display images; multiple processors are used for three-dimensional and tomographic visualizations, video sensor related kinematic and pattern analysis and kinematic simulations; quantities of samples are injected into the cell for observing the cell activity; imaging is done using high energy particles such as alpha particles or x-rays; concentrations of the particles determined at various locations within the cell; pattern analysis algorithms are used to the video image records to discern geometric relationships; the imaging system generates visual imagery at

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a high rate; the system tracks the particles as trajectories; computational analysis of image data is used to solve for surface topography depicting cellular or chemical activities and object spatial deformations over time (**Silver**, U. S. Patent 6,078,681);

(2) a method of generating a 2-D realistic image using discrete representations of 3-D continuous objects employs a discrete 3-D voxel representation of each 3-D continuous object of the scene; each discrete voxel representation is stored in a cubic frame buffer of voxels; each voxel stores information corresponding to the attributes of that portion of the scene; a voxel connectivity is selected for the families of 3-D discrete rays which will act upon the 3-D continuous objects; a method is provided for efficient ray tracing; the method traverses 3-D discrete rays through discrete 3-D voxel representations stored in the cubic frame buffer to create photorealistic images of the scene; the method determines whether it is appropriate to step along x, y or z axes to choose the next voxel to properly represent the continuous line; the ray tracing method is computationally fast (**Kaufman et al.**, U. S. Patent 5,442,733);

(3) a system and method for providing radiation therapy; an imaging system acquires in-vivo images of the area to be treated with radiation at each position along the length of the treatment volume and passes them to the treatment planner; the treatment planner assembles the transverse two-dimensional images and reconstructs the three-dimensional image of the volume; a dose and image registration unit within the treatment planner overlays the dose upon the treatment volume and displays the information to the medical personnel on a display; the treatment planner receives the dose prescription and calculates the desired dose of radiation using a Cartesian coordinate system; the treatment planner provides the treatment plan to the medical personnel (**Fox et al.**, U. S. Patent 6,083,167); and

(4) radiation therapy implemented by placing a radiation source within the tissue to be treated; the radiation source is selected to emit low energy radiation such as X-rays or beta particles; placing discrete radioactive sources in a regular three dimensional array in the living body; use of a radioactive line source for a series of discrete radioactive sources in a regular three dimensional array simplifies treatment planning and reduces the potential for an area within the treatment volume from receiving inadequate radiation (**Coniglione et al.**, U.S. Patent 6,589,502).

6.1 Applicants' first set of claims consists of Claims 1-4 and 7-11.

Independent Claim 1 is directed to a method for tracking a particle through a geometric model. The claim identifies the uniquely distinct features of:

“determining a material of both the one uniform volume element and the another uniform volume element” and “terminating the traversing the particle when the material of the another uniform volume element is substantially different from the material of the one uniform volume element”.

Because the closest prior art fails to teach or fairly suggest determining a material of both the one uniform volume element and the another uniform volume element; and terminating the traversing the particle when the material of the another uniform volume element is substantially different from the material of the one uniform volume element, as claimed by the Applicants, Claims 1-4 and 7-11 are deemed novel and allowable.

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6.2 Applicants' second set of claims consists of Claim 12.

Independent Claim 12 is directed to a method for tracking a particle through a geometric model. The claim identifies the uniquely distinct features of:

“traversing the particle along the particle track from one uniform volume element to another uniform volume element in integer based increments; wherein the particle track has at least one secondary direction of movement, and further comprising calculating an error term for each secondary direction of movement, the error terms being used to adjust a coordinate value whenever the error term exceeds a threshold value”.

Because the closest prior art fails to teach or fairly suggest traversing the particle along the particle track from one uniform volume element to another uniform volume element in integer based increments; wherein the particle track has at least one secondary direction of movement, and further comprising calculating an error term for each secondary direction of movement, the error terms being used to adjust a coordinate value whenever the error term exceeds a threshold value, as claimed by the Applicants, Claim 12 is deemed novel and allowable.

6.3 Applicants' third set of claims consists of Claims 13-16.

Independent Claim 13 is directed to a method for simulating particle transport through a geometric model. The claim identifies the uniquely distinct features of:

“following a particle along the particle track through the geometric model until the material of the next element is substantially different from the material of the starting element”.

Because the closest prior art fails to teach or fairly suggest following a particle along the particle track through the geometric model until the material of the next element is substantially different from the material of the starting element, as claimed by the Applicants, Claims 13-16 are deemed novel and allowable.

6.4 Applicants' fourth set of claims consists of Claims 17-19.

Independent Claim 17 is directed to a method of computationally enlarging a radiation distribution for a treatment volume irradiated during radiation therapy having a radiation source substantially internal within a patient. The claim identifies the uniquely distinct features of:

“simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments along the primary direction of movement until a position when the material of the next element is substantially different from the material of the starting element”.

Because the closest prior art fails to teach or fairly suggest simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments along the primary direction of movement until a position when the material of the next element is substantially different from the material of the starting element, as claimed by the Applicants, Claims 17-19 are deemed novel and allowable.

6.5 Applicants' fifth set of claims consists of Claims 20-28.

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Independent Claim 20 is directed to a computer readable medium having computer executable instructions which when executed on a computer perform a process for tracking a movement of a particle through a geometric mode. The claim identifies the uniquely distinct features of:

“traversing the particle along the particle track in integer based increments until the material of the next element is substantially different from the material of the starting element”.

Because the closest prior art fails to teach or fairly suggest traversing the particle along the particle track in integer based increments until the material of the next element is substantially different from the material of the starting element, as claimed by the Applicants, Claims 20-28 are deemed novel and allowable.

6.6 Applicants' sixth set of claims consists of Claim 29.

Independent Claim 29 is directed to a computer readable medium having computer executable instructions which when executed on a computer perform a process for computationally enlarging a radiation distribution of a treatment volume irradiated during a radiation therapy having a radiation source. The claim identifies the uniquely distinct features of:

“simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments until a position when the material of the next element is substantially different from the material of the starting element”.



Because the closest prior art fails to teach or fairly suggest simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments until a position when the material of the next element is substantially different from the material of the starting element, as claimed by the Applicants, Claim 29 is deemed novel and allowable.

6.7 Applicants' seventh set of claims consists of Claim 30.

Independent Claim 30 is directed to a computer readable medium having computer executable modules including computer executable instructions, which when executed on a computer perform a process for enlarging a radiation distribution of a treatment volume irradiated during a radiation therapy having a radiation source. The claim identifies the uniquely distinct features of:

“a projection module for tracking a movement of a particle through the geometric representation according to integer based steps until a position when the material of a uniform volume element of the plurality is substantially different from the material of a starting element of the plurality of uniform volume elements”.

Because the closest prior art fails to teach or fairly suggest a projection module for tracking a movement of a particle through the geometric representation according to integer based steps until a position when the material of a uniform volume element of the plurality is substantially different from the material of a starting element of the plurality of uniform volume elements, as claimed by the Applicants, Claim 30 is deemed novel and allowable.

6.8 Applicants' eighth set of claims consists of Claims 31-34.

Independent Claim 31 is directed to a method for enlarging a radiation distribution of a treatment volume irradiated during a radiation therapy having a radiation source. The claim identifies the uniquely distinct features of:

"calculating an error term for each secondary direction of movement, the error terms being used to adjust a coordinate value whenever the error term exceeds a threshold value".

Because the closest prior art fails to teach or fairly suggest calculating an error term for each secondary direction of movement, the error terms being used to adjust a coordinate value whenever the error term exceeds a threshold value, as claimed by the Applicants, Claims 31-34 are deemed novel and allowable.

6.9 Applicants' ninth set of claims consists of Claim 35.

Independent Claim 35 is directed to a computer readable medium having computer executable instructions which when executed on a computer perform a process for enlarging a radiation distribution of a treatment volume irradiated during a radiation therapy having a radiation source. The claim identifies the uniquely distinct features of:

"calculating an error term for each secondary direction of movement, the error terms being used to adjust a coordinate value whenever the error term exceeds a threshold value".

Because the closest prior art fails to teach or fairly suggest calculating an error term for each secondary direction of movement, the error terms being used to adjust a coordinate value whenever the error term exceeds a threshold value, as claimed by the Applicants, Claim 35 is deemed novel and allowable.

6.10 Applicants' tenth set of claims consists of Claims 36-39.

Independent Claim 36 is directed to a method for simulating particle transport through a geometric model. The claim identifies the uniquely distinct features of:

“following a particle along the particle track through the geometric model until the material of the next element is substantially different from the material of the starting element”.

Because the closest prior art fails to teach or fairly suggest following a particle along the particle track through the geometric model until the material of the next element is substantially different from the material of the starting element, as claimed by the Applicants, Claims 36-39 are deemed novel and allowable.

6.11 Applicants' eleventh set of claims consists of Claims 40-42.

Independent Claim 40 is directed to a method of computationally enlarging a radiation distribution for a treatment volume irradiated during radiation therapy having a radiation source external to a patient. The claim identifies the uniquely distinct features of:

“simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments along the primary direction of

movement until a position when the material of the next element is substantially different from the material of the starting element”.

Because the closest prior art fails to teach or fairly suggest simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments along the primary direction of movement until a position when the material of the next element is substantially different from the material of the starting element, as claimed by the Applicants, Claims 40-42 are deemed novel and allowable.

6.12 Applicants’ twelfth set of claims consists of Claim 43.

Independent Claim 43 is directed to a computer readable medium having computer executable instructions which when executed on a computer perform a process for computationally enlarging a radiation distribution of a treatment volume irradiated during a radiation therapy having a radiation source. The claim identifies the uniquely distinct features of:

“simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments until a position when the material of the next element is substantially different from the material of the starting element”.

Because the closest prior art fails to teach or fairly suggest simulating a particle movement along each particle track of the plurality of particle tracks through the geometric model in integer based increments until a position when the material of the next element is

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substantially different from the material of the starting element, as claimed by the Applicants,  
Claim 43 is deemed novel and allowable.

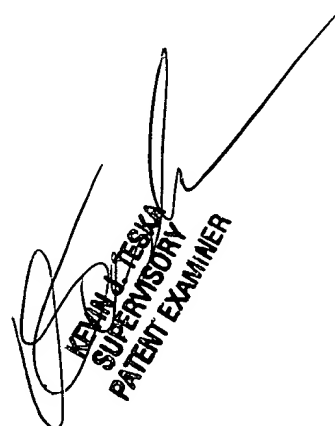
7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

K. Thangavelu  
Art Unit 2123  
May 23, 2005



KEVIN A. TESKA  
SUPERVISOR  
PATENT EXAMINER